PROJECT LEAD THE WAY INTERIM RESEARCH REPORT JULY 2009



Project Lead The Way Evaluation

About this Report:

The principal investigators of the lowa Project Lead the Way evaluation submit an interim report to their grantor—the Kern Family Foundation. This interim report provides an update of research activities and initial findings.

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Executive Summary

The Iowa Department of Education, The University of Iowa, and Iowa State University have cooperated to execute the evaluation of Iowa Project Lead The Way. With the assistance of the Kern Family Foundation, the three research teams have combined multiple data sources to form the Project Lead The Way Evaluation Data Set. A portion of the data set was analyzed and presented in this report. In particular, the research team found:

- Iowa Project Lead The Way enrollment in 2008 was 1,737, a 66 percent increase since 2007.
- Project Lead The Way participants were more likely to be male and white compared to a control group consisting of their peers.
- Participants demonstrated higher cognitive ability in math and science before enrolling in Project Lead The Way compared to their peers.
- During high school participants were more likely to jointly enroll in a community college and engage in a gifted and talented program.
- Participants were less likely to be eligible for free or reduced lunch.
- Project Lead The Way students were more likely to enroll in math and science courses than their peers.

Report

The Kern Family Foundation funded a research grant to the Iowa Department of Education, University of Iowa, and Iowa State University to conduct an evaluation of Iowa Project Lead The Way. The evaluation will compare student outcomes between Project Lead The Way participants and nonparticipants over a three-year period.

Specifically, the evaluation will answer, but is not limited to, the following questions:

- What are the demographic characteristics—socio-demographic, academic, and cognitive—of Project Lead The Way students and what characteristics predict entry into the program.
- 2. Does student absenteeism decrease with Project Lead The Way involvement?
- 3. Do Project Lead The Way student take more math and science courses than nonparticipants?
- 4. Are Project Lead The Way students more likely to take a high-level mathematics course than nonparticipants?
- 5. Is the cognitive improvement for Project Lead The Way students greater than nonparticipants?
- 6. Are Project Lead The Way students more likely to graduate from high school?
- 7. Are Project Lead The Way students more likely to transition into higher education?
- 8. Are Project Lead The Way students more likely to transition into STEM-related programs while in postsecondary institutions?

Several statewide educational data sets were combined in order to track students from secondary institutions to postsecondary institutions, which is the first known study to take place in Iowa. The Iowa Department of Education's K-12 dataset, known as Project EASIER, was merged with Iowa Department of Education's Community College Management Information System (MIS) and National Student Clearinghouse. The Project Lead The Way database will soon be merged with transcript data from Iowa's Regent universities.

The resulting data set, simply known as "PLTW", currently contains 95 variables that follow participants and nonparticipants from 2005 to 2008—the most recent data. So far all of the students are still in high school, although future research will follow graduates into postsecondary education.

This report will summarize descriptive data related to the first, third, and fifth research questions. However, these research questions have not been fully answered. Further research will establish the causal link, if any, of Project Lead The Way and the research questions above.

Data Set

Four data sources were merged to form the PLTW dataset. Figure 1 shows the capability of the research team to follow students from 8th grade through college. Several different data sets are used to construct this timeline, which is listed on the bottom of the figure.

First, the Iowa Department of Education houses two databases: (1) Project EASIER; and (2) the Community College MIS. Project EASIER contains data on K-12 students starting, with the exception of course data, in 2005. This data set includes information on which students enrolled in PLTW courses, their academic performance, standardized test scores (Iowa Test of Basic Skills, ITBS and Iowa Test of Educational Development, ITED), and other data. Individual course enrollment is available for all students starting in 2006.

The department also maintains the Community College MIS, which is a comprehensive database of students enrolled in Iowa's 15 community colleges. The database contains demographic information, whether the student received a Pell Grant—a proxy for economic status, the courses in which the student is enrolled, their course program, and other educational and demographic data

The research team will also have access to transcripts from the State's three public (Regent) universities—University of Iowa, Iowa State University, University of Northern Iowa.

Transcripts contain detailed information on a student's academic performance, current and past majors, and graduation date.

Lastly, the department has access to the National Student Clearinghouse—a database of students enrolled at over 3,000 higher education institutions. The research team will be able to track high school and community college students to over 3,000 post-secondary institutions in the United States.

Method

By analyzing Project EASIER's course information, students who were enrolled in a Project Lead The Way course were identified and denoted as a Project Lead The Way student. A "control cohort" was chosen from students who

Figure 1. Progress of Project Lead The Way Students from High School to College



were enrolled a school which offered Project Lead The Way, but were not actually enrolled in any Project Lead The Way courses.

Students have been typically tracked and analyzed by graduation cohorts. Each cohort is based on the year students are expected to graduate. Thus, each cohort has similar ages, equivalent opportunity to participate in Project Lead the Way, and face the same school environment. Four cohorts have been identified in this study—the class of 2008, 2009, 2010, and 2011.

Since the earliest available data was 2005, researchers have educational data on the class of 2008's entire high school enrollment, while researchers only have middle school information from the class of 2011. Researchers will continue to measure student outcomes as students progress through the school system.

Course data is available since 2006. For this paper, courses have been analyzed based on "course area", which is the first two digits of the NCES course codes.

This report only provides descriptive data comparing Project Lead The Way participants and nonparticipants. Descriptive data is broken down by each cohort—2008, 2009, 2010, and 2011. Iowa Project Lead The Way is still quickly expanding in the state so there are large differences between participants expected to graduate in 2008 and the many more participants expected to graduate in 2011.

Results

Figure 1 shows enrollment in Project Lead The Way from 2005 through 2008. In 2008, 1,737 students were enrolled, which was an increase of 66 percent since last year. Overall, 15.5 percent of participants were female, compared to 50.4 percent of nonparticipants.

The data indicates Project Lead The Way will continue to grow in Iowa for the upcoming years. The class of 2008 had 352 students while the class of 2011—who were freshmen in this study—has already enrolled 542 students (see Figure 3). In addition to the larger size, there are demographic differences between the older and younger cohorts.

Over 90 percent of participants were white, compared to 79 percent of the control group (Figure 4). The composition of minorities differed from those of nonparticipants. Hispanics were the largest minority group—3.3 percent—of Project Lead The Way participants, instead of blacks who were the largest minority for nonparticipants. Over two percent of Project Lead The Way

enrollees were black, which was equivalent to enrollment by Asians/Pacific Islanders. In contract, enrollment of black students was over 3 times larger than Asian enrollment.

Students of any grade were still disproportionally white compared to the nonparticipants (see Tables 2-5). However the distribution of minorities differs by each cohort. Hispanic students were the largest minority for the class of 2008 and 2009, but smaller for the class of 2010 and 2011.

Overall, Project Lead The Way is dominated by males, which comprise 84 percent of enrollment (Figure 5). In contrast, the control group is divided evenly between males and females.

Female participation was greater in Project Lead The Way for the younger cohorts. For the class of 2008 and 2009, female participation was 11.6 and 15 percent, respectively. Meanwhile, 16.8 and 17.5 percent of Project Lead The Way enrollment was female for the classes of 2010 and 2011 (see Tables 2-5).

Underclassmen comprised 55 percent of Project Lead The Way enrollment in 2008. The largest group was freshmen which enrolled 31 percent—542 students—of all Project Lead The Way students. Seniors were the smallest group with 20 percent—352 students—of enrollment.

Participants were less likely to be eligible for free and reduced lunch—an indicator of low-income students—than their peers. Twenty-two percent of participants were eligible for free and reduced lunch (Table 1). Meanwhile, 41.4 percent of nonparticipants were eligible for the same program. A married couple with two children are eligible for free meals if they earn less than \$18,200 a year and eligible for reduced price meals if they earn less than \$25,900 (Iowa Department of Education, 2009). One should note that eligibility for free and reduced lunch may be underreported due to the social stigma attached to lunch subsidy programs.

Project Lead The Way participants were also more likely to be enrolled in gifted and talented programs. Gifted and talented students who have either demonstrated achievement or potential ability or require educational services to meet their abilities that are beyond the regular school program. Thirty percent of all participants met those requirements in 2008, compared to 12.6 percent of nonparticipants (Figure 6).

There were only slight differences between participants and nonparticipants for section 504 status and English Language Learners (ELL)/immigrants (see Table 1). Fewer than two percent of Project Lead The Way students were identified as either English Language Learners or immigrants, while 3.6

Figure 2. Enrollment in Project Lead The Way: 2005 - 2008

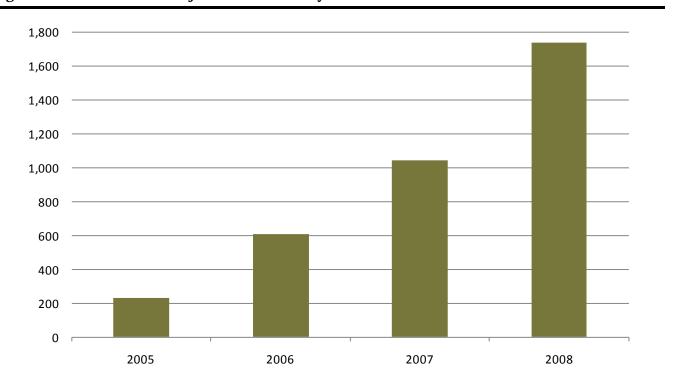


Figure 3. Enrollment in Project Lead The Way by Cohort (Graduating Class)

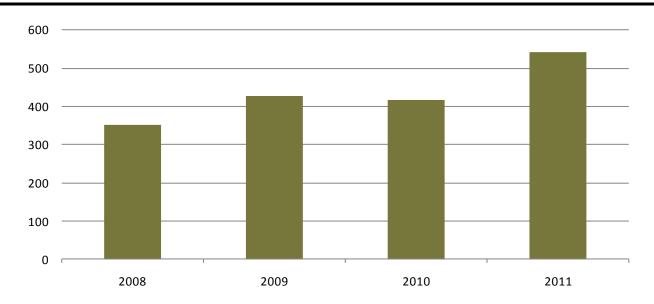
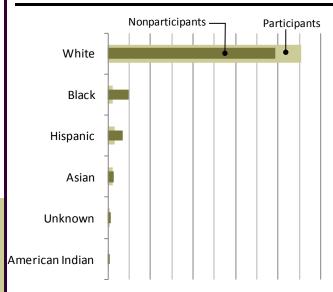
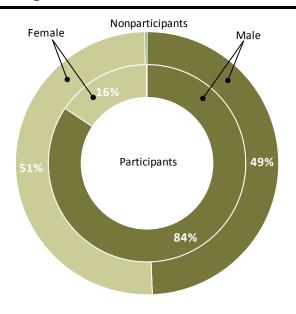


Figure 4. Percentage of Enrollment by Race/Ethnicity and Project Lead The Way Participation



0.0% 20.0% 40.0% 60.0% 80.0% 100.0%

Figure 5. Percentage of Enrollment by Gender and Project Lead The Way Participation



Note: "Unknown" was not labeled. Three-tenths of participants had an unknown gender and 0.1% of nonparticipants had an unknown gender.

percent of the comparison group were identified in those categories. Similarly, section 504 students—those who have a disability that could inhibit learning—were roughly the same proportion at just over one percent.

Finally, Project Lead The Way participants were more likely to jointly enroll at a community college (Figure 7). Joint enrollment permits students to enroll in a community college and high school at the same time in order to earn college credits. Iowa provides several programs which will pay tuition on a student's behalf. Seventeen percent of Project Lead The Way students were jointly enrolled compared to 12 percent on nonparticipants.

Younger students were less likely to jointly enroll than upperclassmen. Thirty-two percent of juniors and seniors were jointly enrolled compared to five percent of freshmen and sophomores (Tables 2-5). Freshmen and sophomores have generally faced greater barriers to joint enrollment. Tighter school schedules and state laws prohibit underclassmen from enrolling at a community college. Iowa Department of Education (2008) shows that 92 percent of all joint enrollees at community college were in their final two years of high school.

Summative Assessments

The State of Iowa requires at least two summative tests—which measure comprehensive knowledge in a subject area—for 8th grade and above—the Iowa Test of Basic Skills (ITBS) for 8th graders and Iowa Test of Education Development (ITED) for high school juniors. Since students do not choose to enter Project Lead The Way until high school, the ITBS scores indicate a student's cognitive ability *before* Project Lead The Way.

The primary focus for researchers will be the performance on the math and science sections of both tests. Since Project Lead The Way is intended to improve achievement in Science, Technology, Engineering, and Math (STEM)-related fields, these areas will measure cognitive ability and improvement.

The preliminary data indicates Project Lead The Way students performed better in math and science before high school and in their junior year. Figures 8a and 8b shows the distribution of student percentiles in the math and science sections of 8th grade ITBS. Eventual Project Lead The Way students were strong in math and science before high school. Sixty-one percent of eventual Project Lead The Way students were above the 80th percentile in math, compared to just 28 percent of nonparticipants. Meanwhile, 55 percent of participants are above the 80th percentile in science, compared to 28 percent of non participants.

Project Lead The Way students also performed comparatively better on the junior year ITEDs (see Figures 8c and 8d). Sixty-four percent of participants were over the 80th percentile in math and 61 percent were over the 80th percentile in science. Only 34 and 36 percent of nonparticipants were above the 80th percentile in math and science, respectively.

Classes

This report presents initial data on course enrollment by Project Lead The Way students. Figure 9 lists the proportion of courses enrolled by participants and nonparticipants for all cohorts since 2006—the latest available data. Courses are

aggregated upon "course areas," which is a broad description of a variety of classes (see Oregon Department of Education, 2009).

Project Lead The Way students were more likely to enroll in mathematics, life and physical sciences, industrial and technology, foreign language, and drafting courses than nonparticipants. Nonparticipants were enrolled in business, consumer and homemaking education, English language and literature, military science, social sciences and history courses at a higher rate.

A note of caution, however, on the interpretation of these results. These courses were totaled for all available years and for all cohort. Three years of course information is available for the 2008 and 2009 cohorts, two years for the 2010 cohort, and one year for the 2011 cohort. Subsequently, some results may be driven by older cohorts, which may be systematically different than younger cohorts.

Conclusion

This report summarized socio-demographic characteristics, testing data, and course-taking patterns for Project Lead The Way students and nonparticipants from 2005 to 2008. In particular, this report provided data related to the first, third, and fifth research question. This section will review those research questions and summarize the related data.

What are the demographic characteristics—sociodemographic, academic, and cognitive—of Project Lead The Way students and what characteristics predict entry into the program?

The data indicates Project Lead The Way students are more likely to be white, male, and strong in the area of math and sciences. Whites were overrepresented compared to their peers. Males were also overrepresented in Project Lead The Way compared to their peers, but female participation was higher in the younger cohorts.

A majority of participants are white in all cohorts while whites were overrepresented compared to their peers.

Similarly, eventual Project Lead The Way students performed remarkably higher than their peers in math and science *before* enrolling in the program.

Do Project Lead The Way student take more math and science courses than nonparticipants?

The preliminary analysis indicates that Project Lead The Way students were more likely to enroll in math and science courses. However, we are cautious about the interpretation until further analysis is completed.

Is the cognitive improvement for Project Lead The Way students greater than nonparticipants?

Project Lead The Way students perform better in summative tests than nonparticipants before enrolling in the program and during high school. The gap between Project Lead The Way students and their peers narrow between the 8th grade and junior year, but the analysis is not definitive.

The next phase of research will begin to distinguish the "causal link" between Project Lead The Way and educational outcomes discussed above.

Figure 6. Percentage of Enrollment in Gifted and Talented by Project Lead The Way Participation

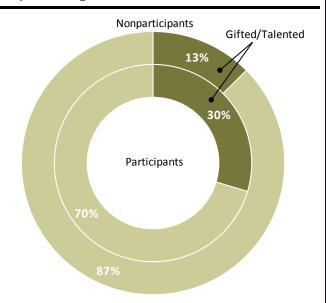


Figure 7. Percentage of Joint Enrollment in Community Colleges by Project Lead The Way Participation

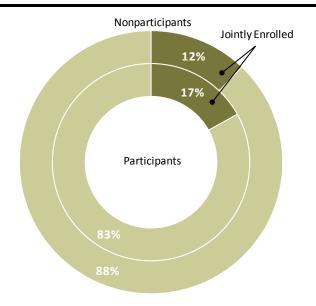
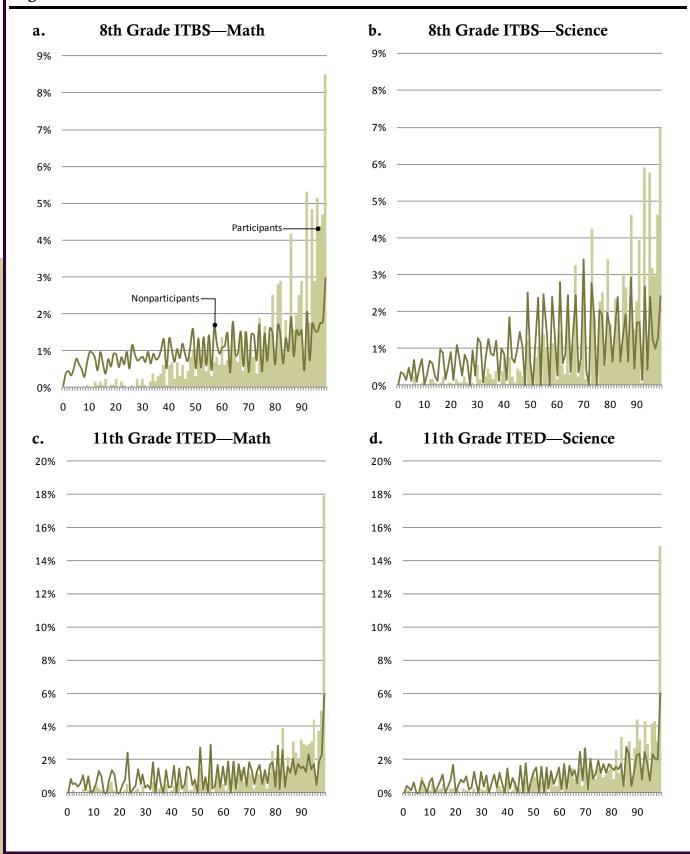


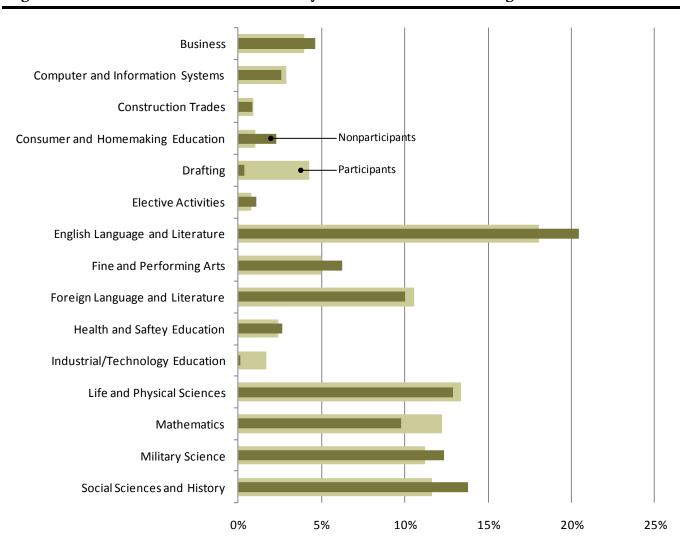
Figure 8. Results from 8th Grade ITBS and 11th Grade ITEDs in Math and Science





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Figure 9. Percent of Course Enrollments by NCES Course Area in High School



Note: Courses are shown as a percentage of all courses and does not necessarily represent the number of students. Courses are totaled for all available high school data since 2006, which includes three years for the 2008 and 2009 cohort, two years for the 2010 cohort, and one year for the 2011 cohort.

Table 1. Project Lead The Way Students and Nonparticipants in 2008

	Control Group		PLTW S	tudents	Total	
	Count	Percent	Count	Percent	Count	Percent
Gender						
Male	17,758	49.4%	1,466	84.4%	19,224	51.0%
Female	18,123	50.4%	270	15.5%	18,393	48.89
Unknown	98	0.3%	1	0.1%	99	0.3%
Ethnicity						
American Indian/Alaskan Native	330	0.9%	6	0.3%	336	0.9%
Asian/Pacific Islander	902	2.5%	41	2.4%	943	2.59
Black	3,499	9.7%	41	2.4%	3,540	9.49
Hispanic	2,433	6.8%	58	3.3%	2,491	6.69
White	28,294	78.6%	1,577	90.8%	29,871	79.29
Unknown	521	1.4%	14	0.8%	535	1.49
Free/Reduced Lunch						
No	21,082	58.6%	1,348	77.6%	22,430	59.59
Yes	14,897	41.4%	389	22.4%	15,286	40.59
Section 504						
No	35,511	98.7%	1,718	98.9%	37,229	98.79
Yes	468	1.3%	19	1.1%	487	1.39
Gifted/Talented						
No	31,462	87.4%	1,222	70.4%	32,684	86.79
Yes	4,517	12.6%	515	29.6%	5,032	13.39
ELL/Immigrant						
No	34,682	96.4%	1,706	98.2%	36,388	96.59
Yes	1,297	3.6%	31	1.8%	1,328	3.59
Joint Enrollment						
No	31,616	87.9%	1,443	83.1%	33,059	87.79
Yes	4,363	12.1%	294	16.9%	4,657	12.3%
Total	35,979	95.4%	1,737	4.6%	37,716	100.09

Table 2. Project Lead The Way Students and Nonparticipants, 2008 Cohort

	Control	Group	PLTW S	tudents	Total	
	Count	Percent	Count	Percent	Count	Percent
Gender						
Male	4,366	50.2%	311	88.4%	4,677	51.7%
Female	4,313	49.6%	41	11.6%	4,354	48.1%
Unknown	18	0.2%	-	0.0%	18	0.2%
Ethnicity						
American Indian/Alaskan Native	74	0.9%	-	0.0%	74	0.8%
Asian/Pacific Islander	227	2.6%	10	2.8%	237	2.6%
Black	698	8.0%	5	1.4%	703	7.8%
Hispanic	514	5.9%	17	4.8%	531	5.9%
White	7,087	81.5%	317	90.1%	7,404	81.89
Unknown	106	1.2%	3	0.9%	109	1.29
Free/Reduced Lunch						
No	5,629	64.7%	280	79.5%	5,909	65.3%
Yes	3,068	35.3%	72	20.5%	3,140	34.79
Section 504						
No	8,591	98.8%	348	98.9%	8,939	98.89
Yes	106	1.2%	4	1.1%	110	1.29
Gifted/Talented						
No	7,808	89.8%	276	78.4%	8,084	89.3%
Yes	889	10.2%	76	21.6%	965	10.79
ELL/Immigrant						
No	8,455	97.2%	341	96.9%	8,796	97.2%
Yes	242	2.8%	11	3.1%	253	2.89
Joint Enrollment						
No	6,346	73.0%	216	61.4%	6,562	72.5%
Yes	2,351	27.0%	136	38.6%	2,487	27.5%
Total	8,697	96.1%	352	3.9%	9,049	100.0%

Table 3. Project Lead The Way Students and Nonparticipants, 2009 Cohort

	Control Group		PLTW S	tudents	Total	
	Count	Percent	Count	Percent	Count	Percent
Gender						
Male	4,095	48.4%	363	85.0%	4,458	50.2%
Female	4,341	51.3%	64	15.0%	4,405	49.6%
Unknown	19	0.2%	-	0.0%	19	0.29
Ethnicity						
American Indian/Alaskan Native	74	0.9%	391	0.0%	465	5.2%
Asian/Pacific Islander	192	2.3%	7	1.6%	199	2.29
Black	689	8.1%	11	2.6%	700	7.9%
Hispanic	544	6.4%	15	3.5%	559	6.3%
White	6,826	80.7%	3	91.6%	6,829	76.9%
Unknown	130	1.5%	-	0.7%	130	1.5%
Free/Reduced Lunch						
No	5,240	62.0%	332	77.8%	5,572	62.7%
Yes	3,215	38.0%	95	22.2%	3,310	37.3%
Section 504						
No	8,330	98.5%	424	99.3%	8,754	98.6%
Yes	125	1.5%	3	0.7%	128	1.49
Gifted/Talented						
No	7,410	87.6%	317	74.2%	7,727	87.0%
Yes	1,045	12.4%	110	25.8%	1,155	13.0%
ELL/Immigrant						
No	8,165	96.6%	421	98.6%	8,586	96.7%
Yes	290	3.4%	6	1.4%	296	3.3%
Joint Enrollment						
No	6,922	81.9%	317	74.2%	7,239	81.5%
Yes	1,533	18.1%	110	25.8%	1,643	18.5%
Total	8,455	95.2%	427	4.8%	8,882	100.0%

Table 4. Project Lead The Way Students and Nonparticipants, 2010 Cohort

	Control	Group	PLTW S	tudents	Total	
	Count	Percent	Count	Percent	Count	Percent
Gender						
Male	4,468	48.8%	345	82.9%	4,813	50.39
Female	4,664	50.9%	70	16.8%	4,734	49.49
Unknown	30	0.3%	1	0.2%	31	0.39
Ethnicity						
American Indian/Alaskan Native	87	0.9%	2	0.5%	89	0.9
Asian/Pacific Islander	235	2.6%	13	3.1%	248	2.6
Black	961	10.5%	11	2.6%	972	10.1
Hispanic	644	7.0%	11	2.6%	655	6.8
White	7,107	77.6%	376	90.4%	7,483	78.1
Unknown	134	1.5%	3	0.7%	137	1.4
Free/Reduced Lunch						
No	5,147	56.2%	317	76.2%	5,464	57.0
Yes	4,015	43.8%	99	23.8%	4,114	43.0
Section 504						
No	9,045	98.7%	410	98.6%	9,455	98.7
Yes	117	1.3%	6	1.4%	123	1.3
Gifted/Talented						
No	7,943	86.7%	287	69.0%	8,230	85.9
Yes	1,219	13.3%	129	31.0%	1,348	14.1
ELL/Immigrant						
No	8,783	95.9%	410	98.6%	9,193	96.0
Yes	379	4.1%	6	1.4%	385	4.0
Joint Enrollment						
No	8,784	95.9%	386	92.8%	9,170	95.7
Yes	378	4.1%	30	7.2%	408	4.3
Total	9,162	95.7%	416	4.3%	9,578	100.0

Table 5. Project Lead The Way Students and Nonparticipants, 2011 Cohort

	Control Group		PLTW S	tudents	Total	
	Count	Percent	Count	Percent	Count	Percent
Gender						
Male	4,829	50.0%	447	82.5%	5,276	51.7%
Female	4,805	49.7%	95	17.5%	4,900	48.0%
Unknown	31	0.3%	-	0.0%	31	0.39
Ethnicity						
American Indian/Alaskan Native	95	1.0%	4	0.7%	99	1.09
Asian/Pacific Islander	248	2.6%	11	2.0%	259	2.59
Black	1,151	11.9%	14	2.6%	1,165	11.49
Hispanic	731	7.6%	15	2.8%	746	7.39
White	7,289	75.4%	493	91.0%	7,782	76.29
Unknown	151	1.6%	5	0.9%	156	1.59
Free/Reduced Lunch						
No	5,066	52.4%	419	77.3%	5,485	53.79
Yes	4,599	47.6%	123	22.7%	4,722	46.39
Section 504						
No	9,545	98.8%	536	98.9%	10,081	98.89
Yes	120	1.2%	6	1.1%	126	1.29
Gifted/Talented						
No	8,301	85.9%	342	63.1%	8,643	84.79
Yes	1,364	14.1%	200	36.9%	1,564	15.39
ELL/Immigrant						
No	9,279	96.0%	534	98.5%	9,813	96.19
Yes	386	4.0%	8	1.5%	394	3.99
Joint Enrollment						
No	9,564	99.0%	524	96.7%	10,088	98.89
Yes	101	1.0%	18	3.3%	119	1.29
Total	9,665	94.7%	542	5.3%	10,207	100.09

Table 6. Summary of Percentile Ranks for ITBS and ITED Math and Science by Project Lead The Way Participation.

	Math				Science			
	Mean	Median	Std. Dev.	Count	Mean	Median	Std. Dev.	Count
ITBS								
Participants	79.53	86	19.02	1,321	78.76	84	18.53	1,321
Nonparticipants	57.98	61	27.94	25,683	61.18	64	25.42	25,683
TED								
Participants	80.46	88	21.16	748	79.25	87	21.58	748
Nonparticipants	61.32	66	28.50	16,684	64.88	70	26.89	16,684

Table 7. Percentage of Courses by Course Area and Project Lead The Way Participation

	Stud	dents	Percei	ntage
	Control	PLTW	Control	PLTW
Courses	Group	Students	Group	Students
Business	19,486	912	33.7%	34.0%
Computer and Information Systems	10,873	670	18.8%	25.0%
Construction Trades	3,536	211	6.1%	7.9%
Consumer and Homemaking Education	9,543	240	16.5%	9.0%
Drafting	1,422	981	2.5%	36.6%
Elective Activities	4,554	179	7.9%	6.7%
English Language and Literature	85,852	4,150	148.5%	154.9%
Fine and Performing Arts	26,167	1,150	45.3%	42.9%
Foreign Language and Literature	41,943	2,426	72.6%	90.5%
Health and Safety Education	11,033	547	19.1%	20.4%
Industrial/Technology Education	459	390	0.8%	14.6%
Life and Physical Sciences	54,004	3,085	93.4%	115.1%
Mathematics	41,050	2,819	71.0%	105.2%
Military Science	51,779	2,582	89.6%	96.3%
Social Sciences and History	57,807	2,680	100.0%	100.0%

Note: Courses are shown as a percentage of all courses and does not necessarily represent the number of students. Courses are totaled for all available high school data since 2006, which includes three years for the 2008 and 2009 cohort, two years for the 2010 cohort, and one year for the 2011 cohort.

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